navanu

Wireless E-911

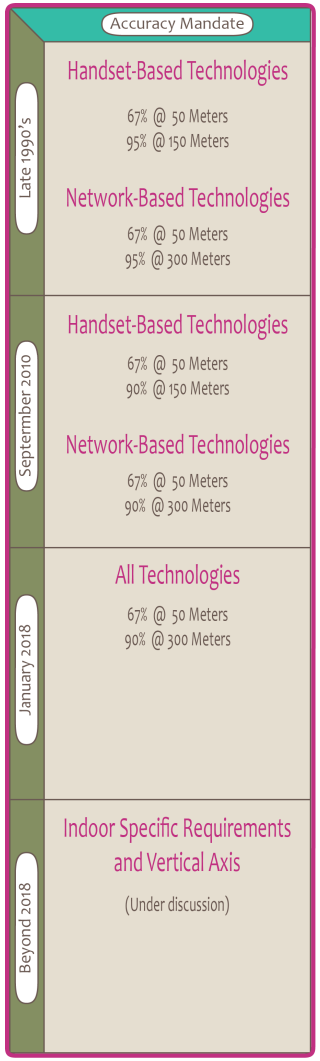
The next phase!

Presented to:

Federal Communications Commission

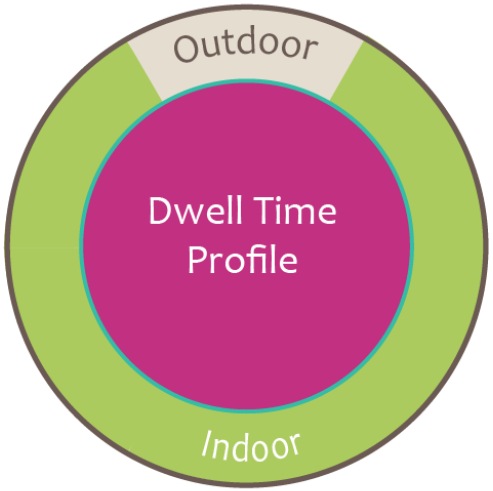
December 18, 2012

. : The Mandate



- Post landline location is dynamic
- Solutions needed for emergency response
- Indoor positioning remains a challenge
  - Wireless
  - VoIP
  - Data
  - Etc.

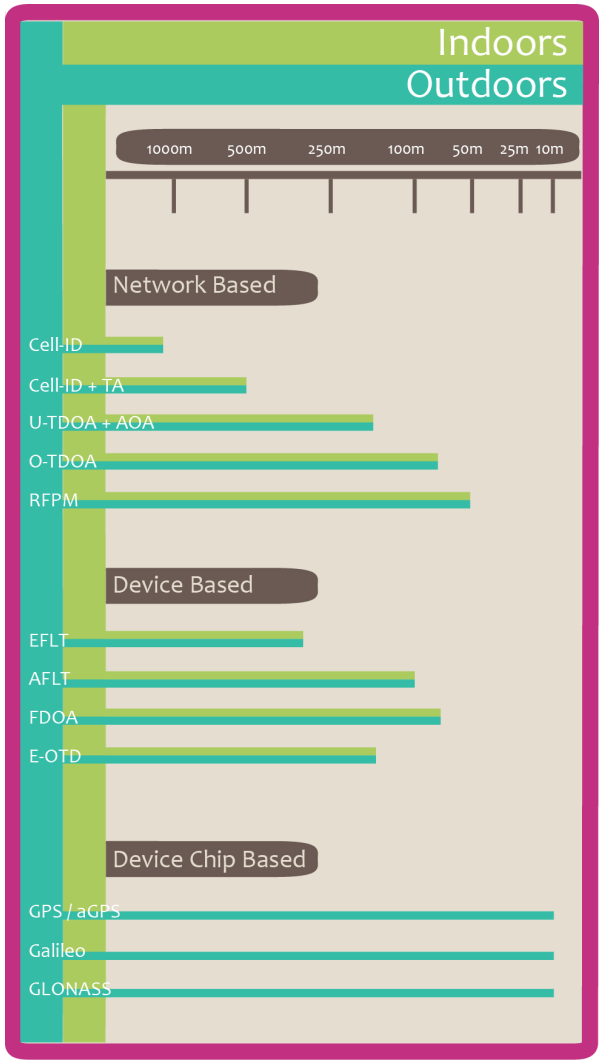
The shift to mobility



Population is:

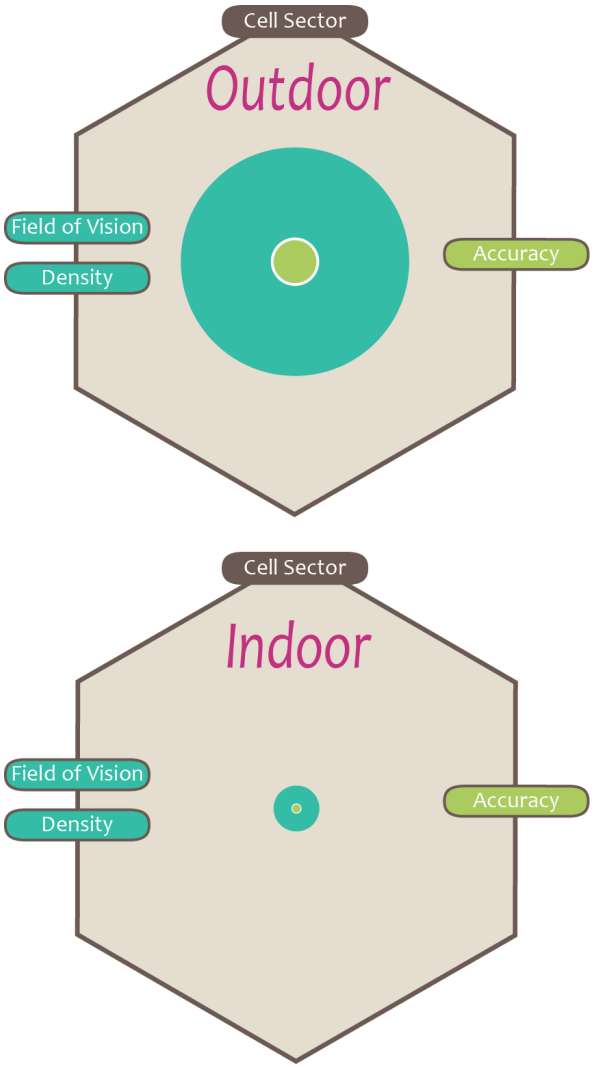
- Increasingly mobile
- Mobile dependent
- Always connected
- Cord cutting

. : Today's Technologies



- Network Based
  - Cell-ID
  - Cell-ID + TA
  - U-TDOA + AOA
  - O-TDOA
  - RFPM
- Device Based
  - EFLT
  - AFLT
  - FDOA
  - E-OTD
- Device Chip Based
  - GPS/AGPS
  - Galileo
  - GLONASS

. : Going Indoors



- Indoors
  - 80% of the time
  - 60% of calls
  - 70% of data
- Line of sight
  - Obstructions
  - Multiple floors
- Density
  - People per square foot
  - Needle in a haystack

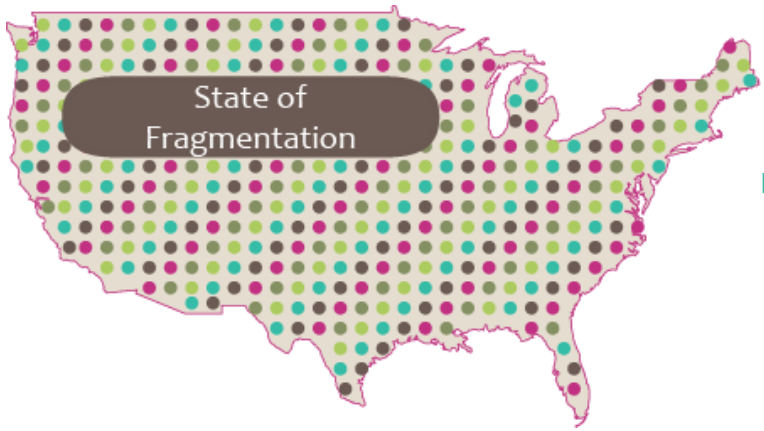
. : Bridge Technologies

Methods

- Wi-Fi
- Bluetooth
- Sound
- Lighting
- TV Channels
- Augmented Reality
- Sensors
  - Dead-reckoning
  - Compass
- GPS Augmentation
  - Pseudollites
  - Terrestrial transmitters

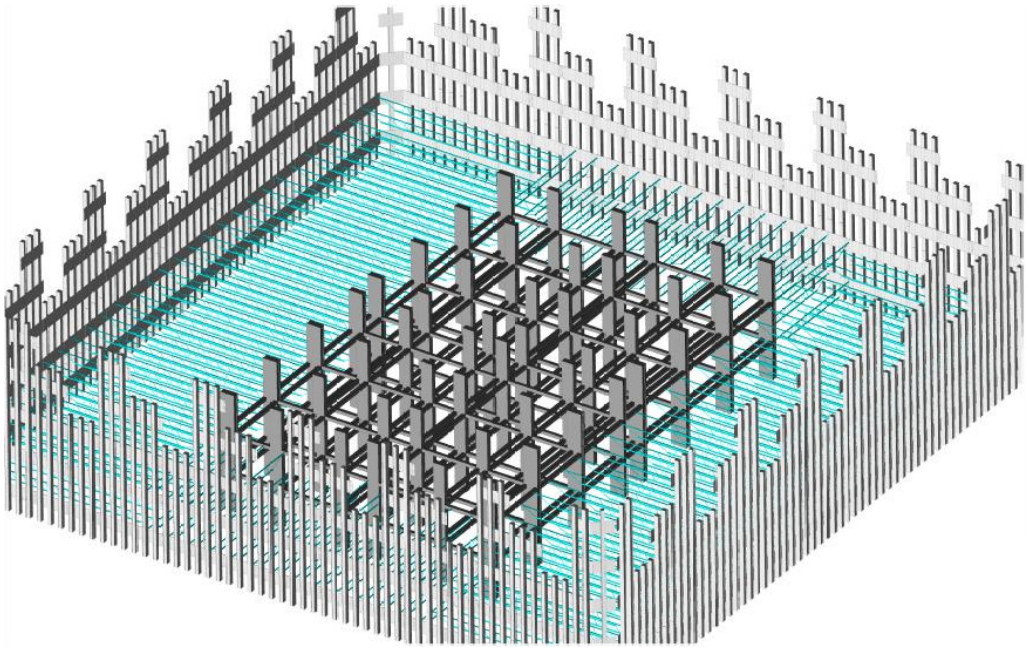
. : Achilles Heel

The Swiss cheese effect



- Non-universal
  - Only works with supported phones
- Local control
  - No ongoing location quality guarantee
- Scalability
  - Location specific technologies
  - Individual building deployment
  - New hardware & maintenance required

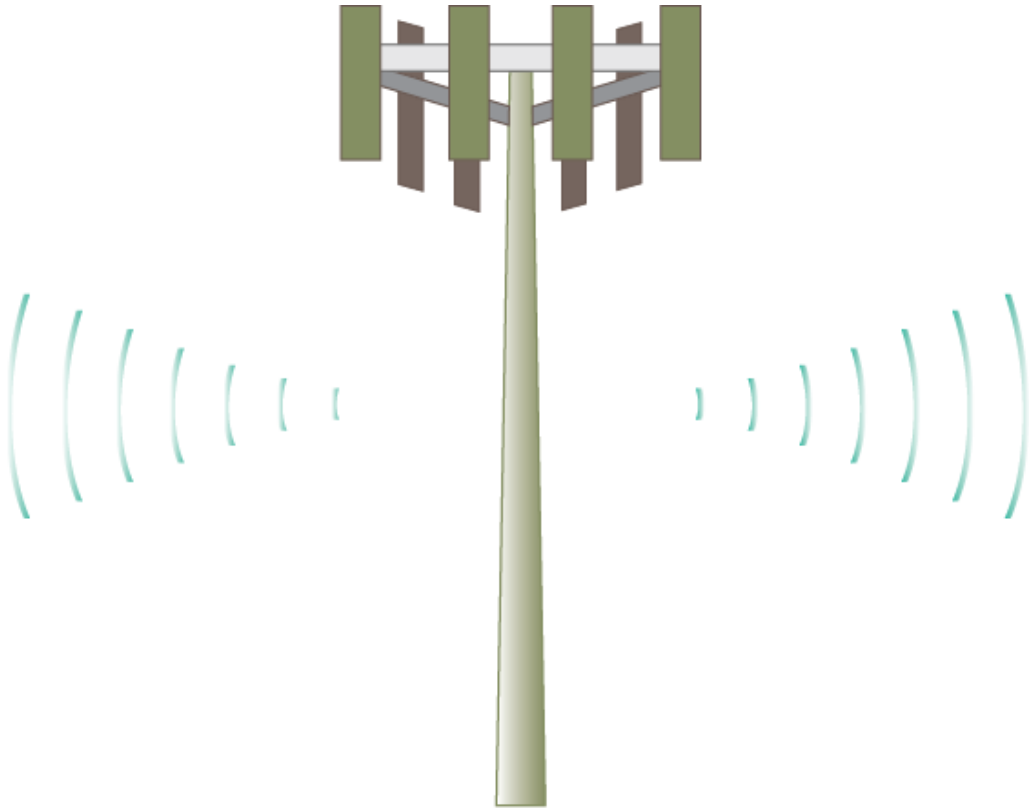
. : Barriers



Factors to consider

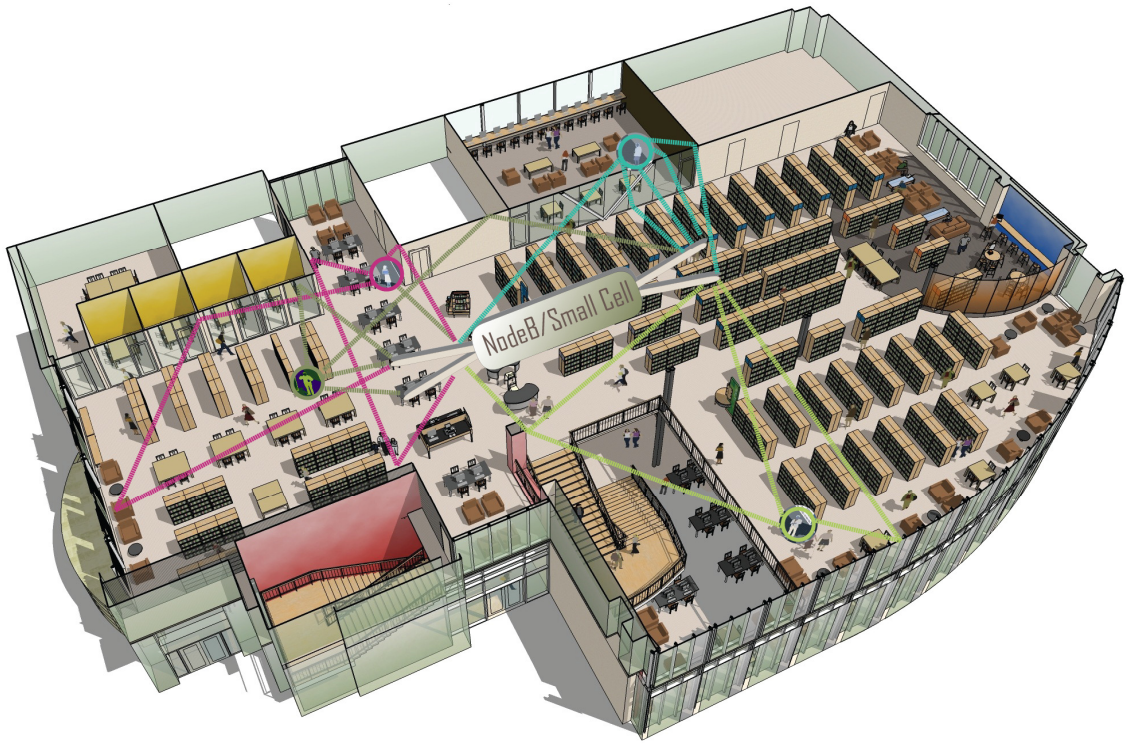
- Signal
  - Coverage
  - Distortion
- Infrastructure
  - Backhaul
  - Power
  - Maintenance
- Access
  - Accessibility
  - Ownership
  - Responsibility
- Cost
  - Installation
  - Equipment
  - Maintenance
  - Upgrades

The Carrier Network



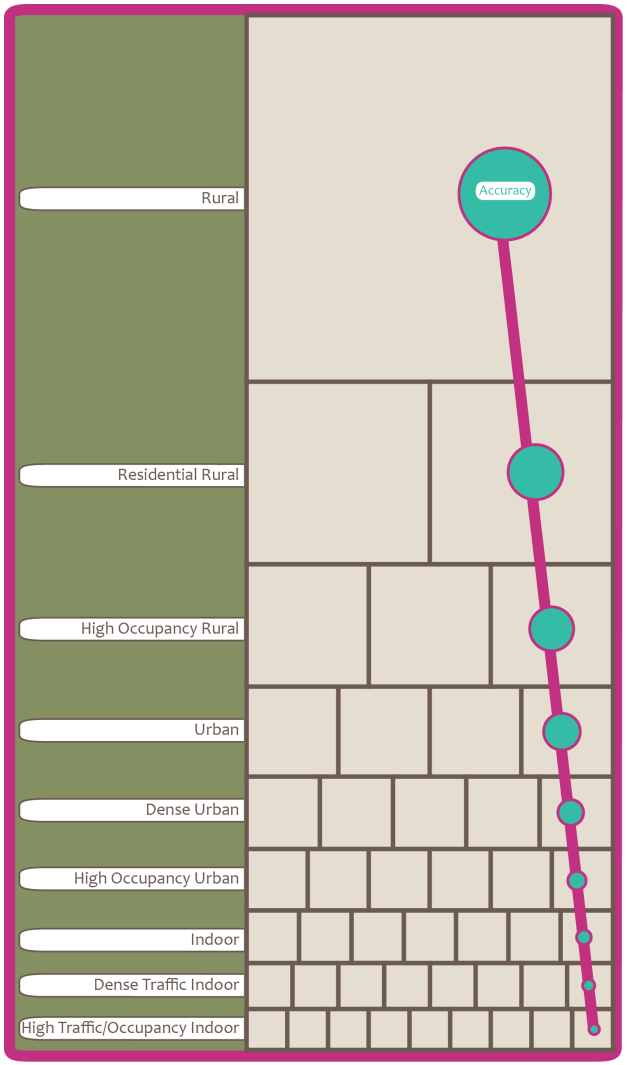
- Universal presence
- Migration to heterogeneous networks
- Universal device support
- Infinitely Scalable
- Central management
- E-911 participant & Infrastructure
- Existing support & maintenance

The only thing missing is the technology



- LAMP - Location by Analysis of Multiple Paths
  - Multi-path TOA
  - Multi-Path AOA
  - 3D RF modeling
  - Constantly improving
  - Self learning
  - Self Adjusting

. : Suggested Mandate



- Sliding scale requirements
  - Line of Sight v. Accuracy ratio
  - Density v. Accuracy ratio

Opportunity for improved government

- Road Safety

  - Network managed enforcement

- Geo Alerts

  - Pinpoint alerts
  - Addition to WLA-CMAS

- Emergency Response

  - Situational awareness
  - Individual location
  - Snapshot of area

- Urban Planning

  - Urban design
  - Congestion planning

- Surveillance

  - Espionage
  - Monitoring

- Military

  - Situational awareness
  - Threat Discovery

. : Alternative ROI

Beyond compliance

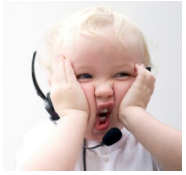
Applications

- Contextual apps
- OS agnostic apps

Network

- Network monitoring
- Optimize service

Engage customers



- New markets
- Empower industries (i.e. retail, advertising, etc.)

Advertising

- App ad platform
- Improve targeting

Data platform

- Empower applications
- Anonymised data platform

Analytics

- Activity graph
- Big data insights
- Prediction engine

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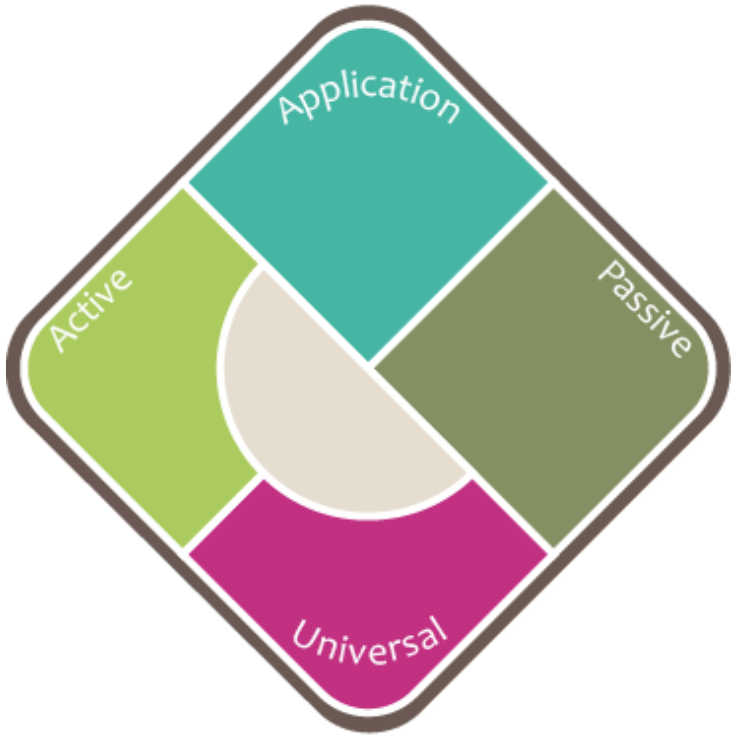
Solution Comparison

The deep dive breakdown

A journey in the challenge of the great indoors

. : Competition I

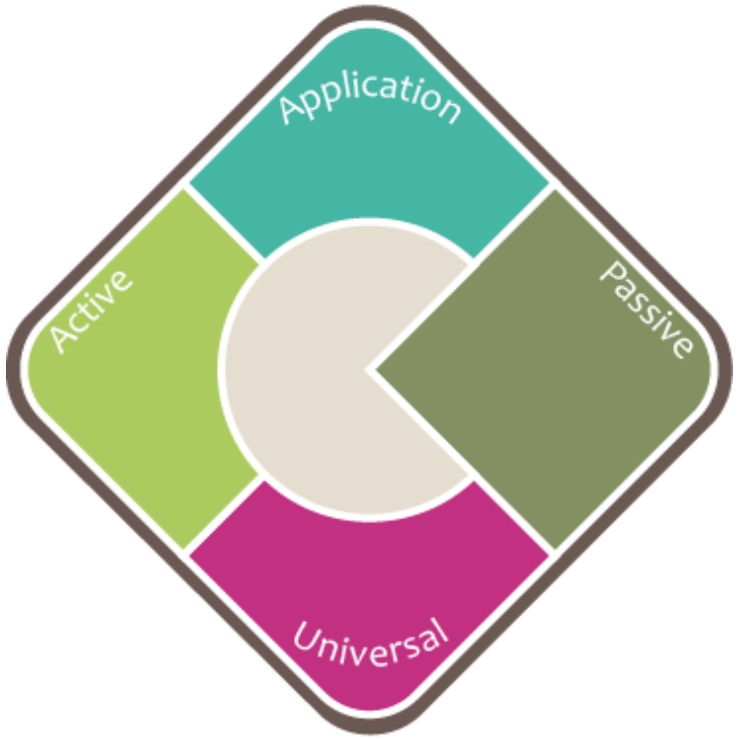


- *Use-Cases*
  - Wiretap
  - E-911
  - National Security
  - Espionage
- *Characteristics*
  - Network Intense

Companies

TruePosition ○ Polaris Wireless

. : Competition II



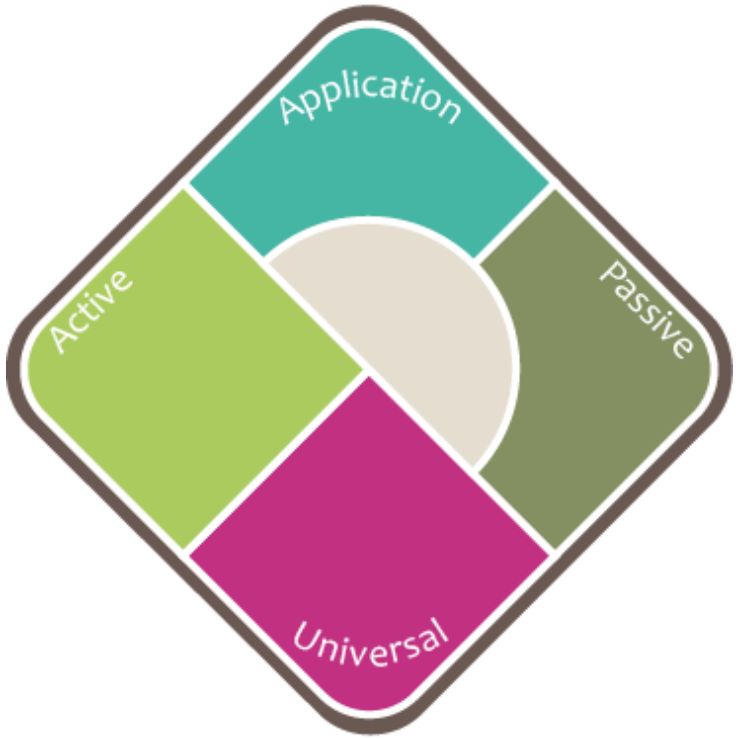
- *Use-Cases*
  - Applications
- *Characteristics*
  - Network Intense
  - Data Usage
  - Power Usage
  - User Initiated
  - OS Specific

Companies

Qubulus ○ Polaris Wireless ○ Glopos ○ GeoLOQI ○ Google Location* ○ Skyhook* ○ Combain* ○ Apple Location*

* For accuracy requires WiFi

. : Competition III

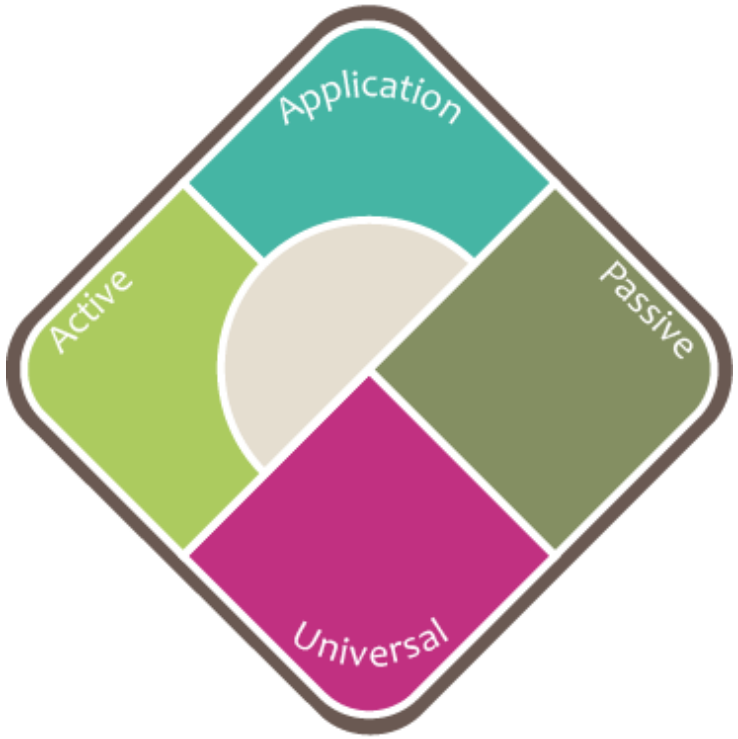


- *Use-Cases*
  - Applications in background
- *Characteristics*
  - Network Intense
  - Data Usage
  - Battery draining
  - OS Specific

Companies

Qubulus ○ Polaris Wireless ○ Glopos ○ GeoLOQI ○ Google Location ○ Skyhook Wireless ○ Apple Location

. : Competition IV

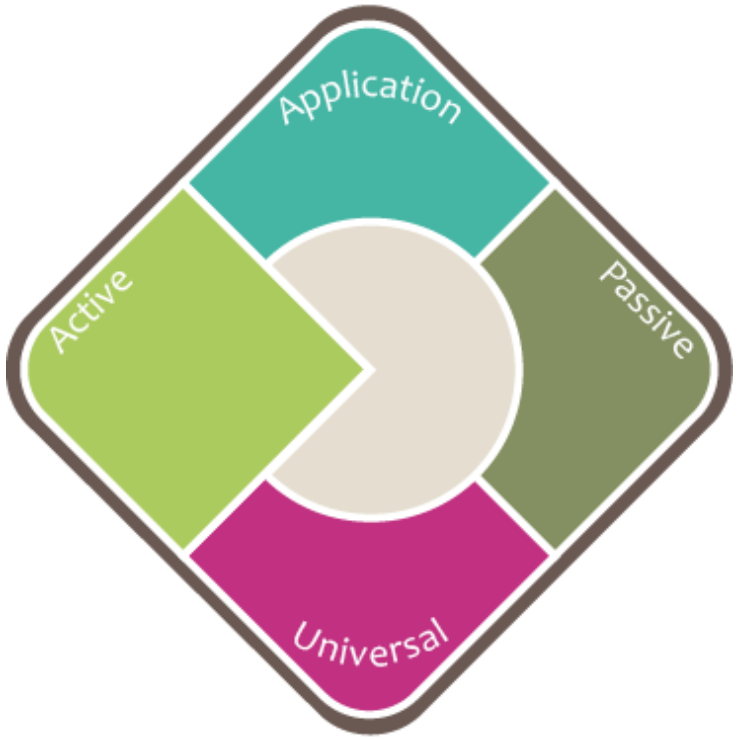


- *Use-Cases*
  - Applications for micro-location
- *Characteristics*
  - Require additional hardware (Wifi, GPS, MEMS, Bluetooth, etc)
  - Network Intense
  - Data Usage
  - Battery draining
  - OS Specific

Companies

PointeInside ○ Wifarer ○ PoleStar ○ Insiteo ○ Loctronix ○ CSR ○ Broadcom ○ Nokia ○ Shopkick ○ Aisle411 ○ Walkbase ○ Bytelight ○ Euclid ○ GeLo ○ NextNav ○ Locata Networks ○ SenionLabs ○ Texas Instruments ○ Ekahau ○ WirelessWERX ○ Indoor Atlas

. : Competition V



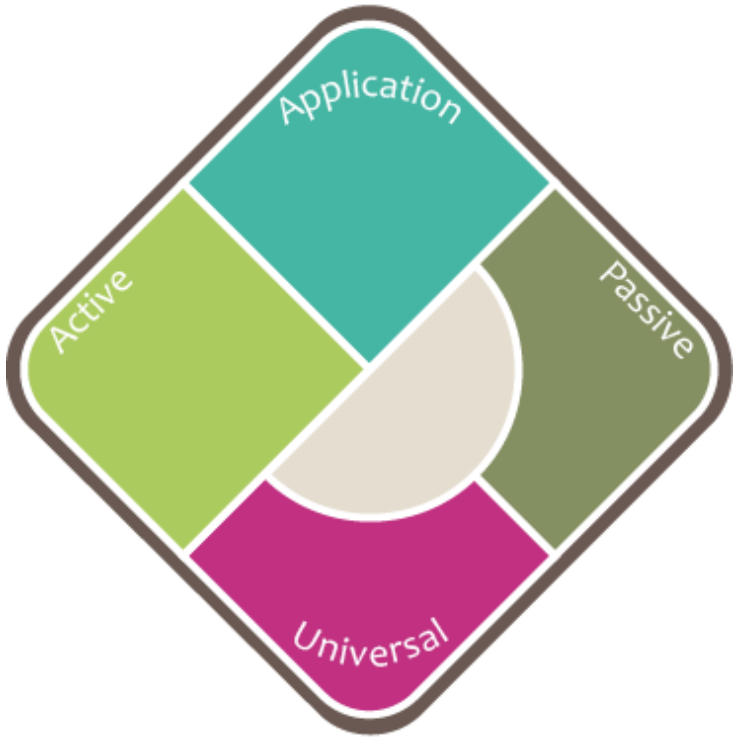
- *Use-Cases*
  - Applications in background
- *Characteristics*
  - Network Intense
  - Data Usage
  - Power Usage
  - OS Specific
  - Device based

Companies

Qubulus ○ Polaris Wireless ○ Glopos ○ GeoLOQI ○ Google Location* ○ Skyhook* ○ Combain* ○ Apple Location* ○ Location Labs ○ Indoor Atlas

* For accuracy requires WiFi and/or GPS

. : Competition VI



- *Use-Cases*
  - Cloud based
  - Location triggered
- *Characteristics*
  - Minimal signaling
  - No data usage
  - Device agnostic
  - Universal

Companies

Navanu ○ Path Intelligence